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CLAIMS

What is claimed is:

1. An apparatus, comprising:

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a cylinder having opposed ends;

a piston disposed for reciprocating movement between the opposed ends of the cylinder;

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drive means connected to the piston for providing the reciprocating movement of the piston;

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sensor means in communication with said cylinder for sensing contact of said piston and either of said opposed ends, and generating a contact signal representing said contact.

2. The apparatus according to claim 1, further comprising:

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control means interconnecting said sensor means and said drive means, the control means adapted to receive said contact signal and generate a control signal to said drive means to adjust reciprocating movement of the piston.

3. The apparatus according to claim 2, wherein the drive means, the sensor means and the control means comprise:

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a closed loop control system.

5 4. The apparatus according to claim 1, wherein the drive means is selected from the group consisting of a variable voltage driver and a current driver.

5. The apparatus according to claim 1, wherein said sensor means is mounted to an exterior of said cylinder.

10 6. The apparatus according to claim 1, wherein the sensor means, comprises:
a piezoelectric device.

15 7. The apparatus according to claim 1, wherein the apparatus is a vacuum pump.

20 8. A system for controlling a reciprocating apparatus having a cylinder, a piston adapted for reciprocating movement in the cylinder, and a driver for moving the piston, the system comprising:

sensor means mounted to said cylinder for generating a first signal representing contact between the piston and the cylinder; and

25 control means interconnecting said sensor means and the driver, the control means responsive to the first signal to generate a second signal to the driver to control movement of the driver and the piston.